

Theatres must be considered the most favourable for affording the opportunity of employing acoustical forms: since, although the performers may be many, the space within which they have to appear is limited: to their walls, ceilings, and seating, therefore, may severally be given those curvatures and angles which are known to be most conducive to the agreeable reception of sound by an audience. Much of the success, however, will always depend on the arrangement of the stage and proscenium: these, together, may be compared to a great speaking-trumpet—its tube, the stage, requiring to be close round the sides, and widening to the mouth; and the latter, or proscenium, having such a play all round as at once to receive the sounds well from the stage, and give them out well to the house. The stage is usually sloped, about one-quarter of an inch to the foot, but varying according as the pit is relatively high or low: the sight is usually what determines this; but sound must also be considered as having a claim in the arrangement. The sides are usually open, divided by the wings: here, when a performer is speaking, back from the sphere of action of the proscenium, much of his voice is lost to the audience: and hence, when a deep scene is set, it ought to have, at all the wing openings (and not necessarily visible), what, in stage parlance, are denominated *tormentors*, namely, wings placed so as to enclose the stage like an apartment: the same applies to the fly openings overhead. When a soliloquy has to be spoken, or a solo sung, the performer advances towards the foot-lights, when the difference, to the hearing, is usually very remarkable.

The business of the prompter might be facilitated by the introduction of a speaking-tube leading from the "prompt" side to the *o. p.* or "opposite prompt" side, and opening there with a wide trumpet-mouth, at a convenient level for the performers at that side to hear it: and, in very wide stages, where it is usual for the prompter to be placed in the centre, beside the foot-lights, and screened from the audience by an awkward-looking hood, an additional tube, with a similar trumpet-mouth, inclined to the performers at an angle of say 45 degrees, might obviate the necessity for the prompter being so placed, and afford him the means of communicating with the performers placed at either side and in the centre. By the use of such "prompt-tubes" the tendency of the performers to place themselves so as to face the prompter, so disadvantageous to those of the audience who happen to be seated at the *o. p.* side of the house, would be obviated. \* *Ex parenthese*, speaking-tubes are not employed to anything like the extent to which they might be with advantage. How much time and fatigue would be saved if the necessity in private houses were done away with, of ringing for, and bringing a servant up perhaps two or three pairs of stairs, to receive orders which another journey is necessary to execute. In building new houses this should be looked to; and it is rendered the more simple and economical since Whishaw's invention of the Telephonaphon, or whistle-mouth-piece, has superseded the accompaniment of the bell, which was formerly in most cases necessary.

The ancients are understood to have placed empty vases or pots in the walls of their theatres, forums, &c. in order to concentrate sound at particular points: such a course might probably be adopted with advantage in concert-rooms;—reverberations not being so objectionable in music as in oratory; and it would be likely to enhance the effect if tubes, or continuous rods of straight-grained wood, were laid as conductors from the place of performance to each concavity. Were theatres intended for musical performances only, a niche, in form the segment of a sphere, might be sunk in the back of every box in each tier, so as, by concentrated reverberation to give to the music a presence in the most extreme distances within the house. The following circumstance, related by Dr. Arnott, may be quoted in support:—One day, on board a ship sailing along the coast of Brazil, not far out of sight of land, the persons walking the deck, when passing a particular spot, heard distinctly, during an hour or two, the sound of bells, varying as in

human rejoicings: months afterwards, it was ascertained that at the time of observation the bells of the city of St. Salvador, about 100 miles distant, had been rung on the occasion of a festival; and, favoured by a gentle wind, the last, or at least to the human ear, the inaudible vibrations of the sound had been conveyed thus far, and been concentrated to a focus by the concavity of a sail, and, rendered sensible to the hearing.

It is not intended that the substance of this paper shall be much more than suggestive,—inducing thought, and prompting discussion, on a somewhat neglected, but very important and equally interesting subject; one which should be considered essential amongst architectural arrangements. A few remarks as to the mode of applying materials may not, however, be amiss. Considering it convenient, then, to regard sound as a fluid, it is obvious, that smooth surfaces, such as well-polished plastering on walls, will best permit it to glide, or rebound along on its way; and be least permeable, or liable to absorb it, or permit its outward passage; also, that if such surfaces be formed directly on the solid, without any space between, the chance of such escape will be rendered extremely small: on the other hand if the wall-plastering be coarse, open-grained, and coated upon lathing, having a space between it and the masonry, the surface will be comparatively absorbent and non-reflecting. The same will apply to wood-fittings. Should the voice not be so powerful as to be heard with ease in the more remote corners, the transmissive power of wood-fittings (of which the fibres lie in the right direction) may be made advantageously available, if they are so arranged as to part in the proper place with the sound which they convey, and not so as to conduct it outside; while by jointing, panelling, &c., with a material which shall break the continuity of the wood, much of its tendency to carry off sound will be counteracted; and, by filling up the space behind it in like manner, its absorbency will be also reduced; for the former purpose, vulcanized india-rubber might prove serviceable, and for the latter, hemp-waste or sawdust.\* In ceilings, were the laths separated from the joists with strips of felt; and in floors, were the boards separated from the joists with the same material, it would probably be found advantageous. Precautions of these kinds apply to all surfaces, whether vertical or horizontal. In continuation, were everything avoided which we knew was calculated to interfere with a uniform diffusion of sound, or which was liable to confuse it with echoes and soundings;—were ventilation efficient, and so arranged as not to carry sound away;—were harmony in form and colour accomplished, so as that no obtrusive objects should engage the eye to the neglect of the ear;—were windows made double to exclude street din, and prevented from rattling; doors to shut against felted rebates, hinges and latches well soaped, floors matted—not bare and covered with grit;—were these, and much more, both negative and positive, which each new case would suggest, systematically put in practice, benefit would accrue which would compensate for both the trouble and cost.

#### ON THE ARCHITECTURE OF FURNESS ABBEY.

CLASSIFICATION OF STYLES—CISTERCIAN ABBEYS.

THE history of English architecture may be divided into seven distinct periods, of the earliest of which the remains are so few and left in such a fragmental condition that its comparative illustration is impossible. One principal division of Church Architecture has been recognised and adopted by all who have written on the subject; that, namely, which separates ecclesiastical buildings into two classes; in the first or earlier of which the circular arch was exclusively employed, and in the second or latter the pointed arch alone was used. To the former of these the term Romanesque has been given, and to the latter the term Gothic. This division is so simple, and at the same time so strongly

marked, that without entering into a discussion as to the propriety of the terms themselves, but contenting ourselves with the fact that they are already in general use; we end have little hesitation in accepting this primary division as the groundwork of our system. At the same time it is manifest that, for purposes of detailed description, it is not sufficiently minute, and that a further subdivision is necessary. It is also clear that it includes a large class of buildings that were erected during the period, which intervened between the first appearance of the pointed arch, and the final disappearance of the circular arch, and of which the church of Furness Abbey is a valuable example. As regards the buildings of the Romanesque period, no subdivision of them can be more satisfactory than that which has already been for some time in use, and which divides them into those that were built before and after the Conquest, and designates them accordingly Saxon and Norman. As regards the buildings of that intermediate period just mentioned, to none can the term transitional be so aptly applied as to those which were erected under influences created by that remarkable contest between great antagonistic principles, which, after having been carried on for nearly half a century, terminated in a complete revolution in the style of building at the close of the twelfth century. Lastly, as regards the Gothic period, no subdivision of it appears to be so natural and convenient as that which is suggested by the four principal changes in form through which the window passed from the thirteenth to the fifteenth centuries. These changes have been illustrated by means of work on Decorated Windows, published last year. For half a century, or more after the disappearance of the circular arch, the window appeared under a form, which, from its general resemblance to a lancet in its length, breadth, and principal proportions, rather than from any uniform acuteness in the shape of its head, led to the universal application of that term to the windows of the period. This observation applies equally to the window, whether used singly, or in groups of two, three, five, or seven; and equally also to the later as to the earlier examples of the period. It is proposed, therefore, to denominate this the lancet period of Gothic architecture. Out of the practice of combining a plurality of lancets under one arch, or hood-moulding, and of piercing the solid space that intervened between the heads of these lancets and the under side of this arch, a novel and beautiful discovery arose. This was the invention of tracery, by the adoption of which a group of several lancets under one arch was converted into a single window of several lights. For nearly three-quarters of a century after its introduction, the tracery of windows contained forms in which the simplest of all geometrical figures, the circle, was principally conspicuous; and although in the latter part of this period the circle does not obtain the same prominent place in the centre of the window, that is generally allotted to it in the earlier examples, yet the important part that it bears in the construction of the design of even the whole of their later examples, fully justifies the application of this term, already in pretty general use to this class of windows, and entitles us accordingly to call this period, by the same rule, after that figure, and, *par excellence*, the geometrical period. At the close of this period, a feature began to make its way into the subordinate parts of the tracery, which had already shown itself for sometime previously in the mouldings, and which eventually exercised a most important influence on the architecture of the next half-century. This feature was the curve which mathematicians call the curve of contraflexure, and which is known amongst architects as the ogee. The flowing nature of this curve imparted to the tracery a grace and an ease which the rigid outline of the circle denied it, and affords us a strong point of contrast whereby to distinguish the architects of the two periods. The sinuosity of form, which characterises the tracery, pervades also the mouldings, the carved work, and all the details of this period, and enables us to designate it appropriately as "The curvilinear period." In the latter part of this period a horizontal bar or transom as it is called, is occasionally found, crossing the mullions at right angles in the lower part of the

\* So called by the performers, from the difficulty they present to those at the wings in watching the progress of the performance.

\* A church in Aberdeen, the plastering on the walls of which was upon lathing, having proved very defective as regards hearing, the experiment was tried, with success, of having stripped off the plaster, introducing into the hollow behind the lathing, between the battens, a firm body of the first of these latter materials.